CLAIMS

What is claimed is:

1. In a system having a base station transmitter for transmitting data blocks to one or more mobile stations over a radio link, a method for determining a transmit power level at which to transmit a current block, comprising the steps of:

(a) receiving a quality measurement from a mobile station indicating an average radio link quality over a previous group of blocks, wherein not all of the blocks of the previous group of blocks were necessarily transmitted at the same transmit power level;

(b) determining a transmit power attenuation level for the current block based on the quality measurement; and

(c) subtracting the transmit power attenuation level from an initial transmit power level to determine the transmit power level for the current block.

Sub A1

2. The method of claim 1, wherein the system is a general packet radio service (GPRS) system.

3. The method of claim 2, wherein the system has Mode A and Mode B power control modes, and the initial transmit power level is a Mode A maximum transmit power level.

4. The method of claim 3, wherein the Mode A maximum transmit power level is a broadcast common control channel transmit power level minus a P0 power level assigned to the mobile station during establishment of a downlink temporary block flow (TBF).

5. The method of claim 1, wherein:

the current block is to be transmitted on timeslot *j*; and

the quality measurement indicates the average radio link quality over the previous group of blocks also transmitted on timeslot *j*.

6. The method of claim 1, comprising the further step of transmitting the current block at the transmit power level.

7. The method of claim 1, wherein step (a) comprises the steps of: during transmission of a last block of the previous group of blocks, polling the mobile station for the quality measurement by setting a poll bit in the last block.

8. The method of claim 1, wherein:

the current block is to be transmitted on timeslot j at time n;

the quality measurement indicates the average radio link quality over the previous group of blocks also transmitted on timeslot j; and

step (b) comprises the steps of:

(1) determining a radio link attenuation level $\Delta_{RLC}^{(m)}$ for the current block based on the quality measurement, wherein the radio link attenuation level is the downlink attenuation that the mobile station can tolerate while still achieving acceptable error rate;

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(2) determining an uplink control flag attenuation level $\Delta_{USF}(j,n)$ for the current block which indicates the estimated additional downlink attenuation that can be applied such that adequate uplink state flag (USF) performance is achieved; and

(3) determining the transmit power attenuation level $\Delta(j,n)$ for the current block by taking the minimum of the radio link attenuation level and the uplink control flag.

9. The method of claim 8, wherein:

step (b)(2) comprises the step of setting the uplink control flag attenuation level to a maximum attenuation level if there are no active uplink TBFs on the timeslot j.

10. The method of claim 9, wherein the radio link attenuation level $\Delta_{RLC}^{(m)}$ is determined in accordance with an optimal radio link attenuation level Δ^* and an effective attenuation level $\Delta_{eff}^{(m)}$.

11. The method of claim 10, wherein:

the effective attenuation level $\Delta_{eff}^{(m)}$ is determined in accordance with the following equation:

$$\Delta_{eff}^{(m)} = \frac{\ln\left(\sum_i p^{(m)}(\Delta_i)e^{\alpha\Delta_i}\right)}{\alpha};$$

the optimal radio link attenuation level Δ^* is determined in accordance with the following equation:

$$\Delta^* = \frac{\ln(BER^*) - \ln(\overline{BER}^{(m)}) + \ln\left(\sum_i p^{(m)}(\Delta_i)e^{\alpha\Delta_i}\right)}{\alpha}; \text{ and}$$

Sub B1 the radio link attenuation level $\Delta_{RLC}^{(m)}$ is determined in accordance with the following equation:

$$\Delta_{RLC}^{(m)} \leftarrow \Delta_{eff}^{(m)} + p\cdot(\Delta^* - \Delta_{eff}^{(m)}).$$

12. The method of claim 10, comprising the further steps of:

caching, at the end of a downlink TBF for the mobile station, the radio link attenuation level and the time that the radio link attenuation level was last updated;

at the beginning of the next TBF for the mobile station, retrieving said cached information and decreasing the cached radio link attenuation level to account for elapsed time; and

setting an initial radio link attenuation level for said next TBF in accordance with said cached radio link attenuation level.

13. The method of claim 8, wherein step (b)(2) comprises the step of incrementing the uplink control flag attenuation level if, in a specified previous numberof blocks, there have been no new uplink TBFs and no USF flag errors and no changes in the uplink control flag attenuation level..

14. The method of claim 1, wherein step (b) comprises the steps of:

(1) determining a radio link attenuation level for the current block based on the quality measurement, wherein the radio link attenuation level is the downlink attenuation that the mobile station can tolerate while still achieving acceptable error rate;

(2) determining the transmit power attenuation level for the current block in accordance with the radio link attenuation level.